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CENTRAL INTELLIGENCE AGENCY

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[redacted] operating of a Soviet TU-104 plane. The report includes a physical description of the interior of the plane, the individual duties of each member of the crew including those of the stewardess , brief comments on flying procedures and on the plane's equipment, and a summary to the effect that the plane should present no difficulties to an experienced pilot. 25X1

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1. Regular Line Operation of Aeroflot:

The comments refer to the regular air route from Moscow to Sverdlovsk to Novosibirsk and back.

The boarding of the passengers is completed, at the latest, 20 minutes before take-off, usually only through the forward entrance door (for convenience), so that the ones who come in first have to sit 10 to 15 minutes longer in the cabin, which is not pre-cooled.

The stewardess informs the passengers of the flight route and the type of plane, and on the handling of the oxygen equipment. They have to be strapped in. Candy is also served.

The plane, which is ready for take-off, is towed by a previously connected towing vehicle to the slanting runway. Here it is started with ~~external~~ outboard battery cars (3-ton). The plane rolls very slowly to the take-off, with hand-guided front-wheel steering. The turn must begin on a 60-meter-wide track on the farthest side. 25X1

At the take-off, the passengers take a deep breath, since now, for the first time, there is some circulation of air in the cabin (though it is still warm). The technician is surprised to observe that directly after the plane rises, the take-off runway has reached its end (an average of 2,500 meters). After the landing gear and the landing ramp are retracted, the climb begins. There is noticeable cooling in the cabin from the height of 4 to 6 kilometers.

Cruising height is between 10 and 11 kilometers, mostly above closed cloud formations.

In regard to the seating arrangement in the rear cabin - which has 5 seats (2 left and 3 right), the climb is extremely disturbing to the passengers sitting on the outer right; for this reason, this area is usually left vacant. There is somewhat limited seating comfort. In the seats behind the jets, the degree of noise is too great.

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The seats in the forward cabin are comfortable (almost too comfortable). The degree of noise is endurable. The cabin temperature is normal.

The bill of fare is distributed on trays when the ascent is completed. In spite of the fact that there are three stewardesses, the last passengers are still eating during the descent and at landing, though the flight period is 2 hours and the distance is 1,800 to 2,000 kilometers.

Usually the plane flies around high storm and cumulus clouds. In flying through cumulus clouds 2 to 3 kilometers high, hard bumps are felt throughout the entire fuselage.

About 150 kilometers before the airport, the descent begins in a direct flight. The falling speed in the passenger cabin is checked by a variometer and is maintained at no more than 2 meters a second.

During the landing, the powerful braking effect is noticeable in the passenger cabin.

At the climb, the rolling is done ~~in neutral: by idling~~ at neutral.

When it is not necessary to change tires, the refuelling at interim points takes at least one hour, since the refueling is done without pressure although with two tank cars.

This one-hour waiting period is too great in relation to the entire flight period.

2. Brief Remarks on Flight Operation:

Before the engine is started (usually by an outboard battery) all the functions of each crew member (2 pilots, navigator, flight engineer, radio operator) are checked against the check list on board the plane.

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The turbo take-off equipment works very reliably. The entire starting mechanism operates automatically when the starting button is pressed. Only the temperature, rotation speed, oil pressure, and time must be supervised. For reasons of economy, the so-called "braking" of the engine after take-off is foregone. The control of the engine equipment takes place right before taxiing, at the take-off.

An engine capacity of about 80% is necessary for taxiing from a stopped position; however, it must be throttled back for taxiing at the prescribed idling speed.

The hydraulic equipment of the nose wheel steering gear is switched on when the plane begins to move, since the actual position of the nose wheel is not known, and knocks may occur when the hydraulic equipment is shut off.

In conformity with the size of the aircraft and the wheel width (as well as the insufficient radius of the concrete runway), a large radius must be provided for when taxiing.

In taxiing, the brakes are used only for stopping.

In taxiing for take-off, the effectiveness of the regular and emergency brakes is tested. The emergency brake levers always remain in a position of readiness at take-off and landing and are also used frequently.

The arrangement of the hand wheel for nose wheel steering at the right control board of the chief pilot is extremely inconvenient and tiring for long taxiing periods. In addition, the horizontal position of the steering wheel, particularly after becoming deflected as a result of other procedures, does not always guarantee proper action on the corresponding side.

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Taxiing is unsettled during change of pace. [?]

Experience has shown that the pedal arrangement has to be pulled forward to effect the action of steering. Fundamentally, however, it should be stressed that this steering, although designated only for taxiing, means a great facilitation of taxiing for this large plane, especially on small runways and under the influence of a side wind.

In the take-off position, up to 100 meters of take-off strip is used for taxiing; there is insufficient area at the end of the take-off strip.

The hydraulic switching of the nose wheel steering mechanism must be effected in the central position of the nose wheel.

At take-off, the landing flap is extended at 10 degrees (Moreover, every position from 0 to 35 degrees can be effected with an electric tumbler switch). Braking is effected entirely with the foot brake, and the throttle is opened, with a switching period of about 1-2 seconds. After acceleration of the engine at take-off (after a maximum of 17 seconds) debraking is effected and the plane takes off. The co-pilot must, without fail, keep the gas lever in take-off position, since the friction brake is barely effective.

In accelerating to the speed of SR [?] efficiency of from 130 to 150 kilometers an hour, the brakes must be used for maintaining direction, especially when there is a comparatively light side wind; in the case of a strong side wind, the Q.R. [aileron ?] must be included.

The nose wheel is raised about 200 to 210 kilometers an hour; however, previously it had been eased. In this case, attention should be directed toward seeing to it that it is not set at too great an angle of incidence, but is uninterruptedly reduced. At a speed of 230-240 kilometers an hour, an angle of incidence of about 9 to 10 degrees is set up and kept 25X1 through reduction in direction of pressure. At about 260 to 290 kilometers 25X1

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an hour ($G = 55 \div 70$ tons), the plane rises by itself and passes at this angle of incidence into a climb without stress.

In regard to improvements for the longitudinal axle, especially shortly after climbing, attention must be paid to the Q.R. [aileron] effectivity at the relatively long switching period, which results in reinforcement.

At a height of 25 meters, the wheels are briefly braked, and the landing gear is retracted; the retracting period is about 20 to 25 seconds. When the landing gear is retracted, a barely discernible tail-heavy moment results. At a height of 100 meters, the Lkl is retracted, and operation is throttled to normal, with a V_g of 370-380 kilometers an hour. The change in load distribution at the retraction of the Lkl in the direction of pressure is slight.

After rising to a climbing speed of $V_a = 570$ km/h, loading takes place in the climb passages and the pressure cabins. The maneuverability during climb is normal up to a cruising height of $H = 11$ kilometers and $V_a = 435$ kilometers an hour.

During cruising at 11 kilometers of height with a V_a of 850 kilometers an hour, the plane can only be trimmed slightly around the transverse axis. In curving flight, there is sufficient stability.

A V_{min} of 290 kilometers an hour was attained at a height of 8 kilometers, with landing gear and steering gear on. In this case, there was a strongly decreased, but still sufficient, control effectiveness around all the axes and an unmistakable "nose dive."

The changes in load distribution occurring during cruising as a result of fuel discharge are negligible.

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Single-engine flight with a throttled or stopped engine can easily be effected with the steering wheel without trimming. Turning with a stopped engine is not dangerous.

Safe starting of the engine in flight is possible at a height of 7-5 kilometers, at a V_a of 400 to 500 kilometers an hour.

In gliding with a throttled engine, special attention should be paid to keeping the fuel injection pressure at at least 10 atu.

The actual approach to the air field is effected by well-known radio engineering means. The landing approach is also carried out by "large boxes;" however, by a different method than for the Il-14. The landing gear are lowered before the third turn; after the third turn the steering gear is at 20 degrees, and the V_a is 320 kilometers an hour. The nose-heavy landing flap moment is trimmed away with HR /hand wheel?/ trimming.

While circling the field with the landing flap out, at a V_a of 400 kilometers an hour, there is sufficient stability and controllability. At the landing approach, with landing ~~kx~~ flap and steering gear out, at a V_a of 280 kilometers an hour and less; as has already been mentioned in regard to the take-off, the QR /aileron?/ effectiveness is extremely slow and requires special attention.

After the fourth turn, the steering gear is brought out completely to 35 degrees, the tail load is trimmed, and the landing approach is carried out at about V_a - 340 km/h, so that in flying over the pre-landing beacon, a height of 220 meters and velocity of 290 to 300 kilometers an hour are maintained, and in flying over the main landing beacon, a height of 60-70 meters and a V_a of 270-280 kilometers an hour are maintained. The trimming takes place with a 1.8-2 degree tail load. 25X1

About 250 meters before the beginning of the landing strip, the plane is placed at about 8-10 meters horizontally, and the engine is throttled uninterruptedly while idling, so that the plane is set at an angle of incidence of 10 to 11 degrees, at a V_m of 225-235 km/h.

The hand wheel is pulled out at about 60-70 degrees. After setting down, the hand wheel is fixed and braking immediately takes place until the operation of the automatic brakes.

The arrangement of the brake pedal is so inconvenient that the feet have to be kept right on the lowest position, in order to avoid unintentional braking. The shifting of the feet upward for immediate braking action must be done one after the other, in order ~~xx~~ to avoid unintentional "pulling" and resulting "relifting."

Directly after considerable lessening of the speed, further pulling ~~kk~~ is effected, in order to hold the nose wheel high until it falls down by itself as a result of loss of speed.

If during landing it is pulled a little farther, the plane jumps; this can be stopped only by fixing the control column. Landing with a completely pulled out hand wheel is also possible, of course - however, given an equal gliding speed, this means a considerable use of the landing strip, with a landing speed which is about 10 kilometers an hour, which could be used in earlier landing for the braking distance. Extension of the tail is effected only in the case of extremely backward location of the center of gravity.

For the purpose of controlling the operation of the automatic brake, a light is lit in the forward instrument board. The brake foot power is considerable, and in order to attain a good braking effect, one must really brake very strongly. When there is a side wind, part of the entire braking

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effect is lost through one-sided braking. In approach flight with a side wind, the landing course is maintained through steering at an air angle, which it comes out of shortly before landing, since skidding is not possible because of the too great steering-wheel foot pressure.

The retarding parachute installed in the aircraft is always in readiness and can be used only in extreme necessity. The available landing tracks averaging 2,500 meters in length offer the TU-104 an average of only 300 to 500 meters of reserve.

Shortly before the plane is rolled to a stop, the nose-wheel steering gear is switched on for rolling.

A "scramble" take-off, with a single engine, involves no difficulty. Only the relatively long period for acceleration of the engine has to be taken into consideration; the load distribution changes which occur can easily be controlled without trimming.

The weather minimum for the TU 104 is at present 200 meters ceiling and 3 kilometers visibility, in daytime only, for scheduled line transportation.

3) Remarks on the Equipment:

The braking equipment operates with automatic relief devices. On the rear wheels of the main landing gear are 4 automatic accelerators, all of which operate on only 1 electromagnetic discharge valve. For this reason, the total brake horsepower is slight. Already successful tests have been made with a piece of equipment whereby every automatic accelerator, that is, every wheel, switches its [own] electromagnetic valve. With the present equipment, it frequently happens that, through pressure inclusion, the rear wheels of the main landing gear are blocked, and in spite of the fact that the automatic equipment is in operation, they drag and grind. This is especially disturbing in line transportation.

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The signal lamp, which indicates the operation of the automatic equipment, makes up for the lack of a brake touch.

The stationary brake locks the brake pedal of the chief pilot in a braked position; it is loosened by further pressure.

In airfield operation, the landing gear is not retracted, in order to effect better cooling of the brakes in flight. Water cooling is frequently used.

The engine control equipment (power lever) has too great elasticity; this hampers the precision adjustment of the number of revolutions. There is no synchronization, so that in practice each engine must be adjusted separately.

The engine instruments are easily accessible for maintenance and adjustment.

The fuel equipment is completely automatic and is operated manually with pumps of varied capacity (pressure), which are switched on or off by consecutive switches corresponding to the content indicator of the individual tank groups. The operation of the fire extinguisher is electrical.

The engine's steel covering frequently develops rips.

The radar viewing equipment of the navigator is an important orientation means on route flights at a great height, when the ~~ax~~ ground is not visible.

The arrangement of the equipment in the pilot's cabin is extremely involved.

For instance, hardly any equipment is attached to the place of the flight engineer. All the equipment is located either right near or between the pilots. The starting of the engine is the basic responsibility of the chief pilot. During the flight, the flight engineer takes the spare seat between the pilots; however, most of the time he stands and maintains and

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controls the fuel equipment, content indicator, and consumption gauge, as well as the air conditioning equipment, which he must operate by reaching around the co-pilot's control board.

The air conditioning and pressure equipment do not guarantee sufficient fresh air for the crew near the ground; the ventilators are always running, and the pilots sweat profusely. If air pressure ventilation were installed, a monument would be erected to the designer by the pilots who re-train later on in this type of plane.

The oxygen equipment of the crew is kept in readiness so that it is available for quick use on longer flights. Each crew member has his own connection to the general supply.

Two PCUY-3M stations are available for ultra-short-wave radio telephony and can be used by both pilots. These are adequate for internal communication in the USSR.

For training, the crew's entrance in the nose wheel shaft is used. The telescope ladder used requires some skilled know-how on the part of the crew, similar to that required for a hanging rope-ladder.

4. Summary:

The TU 104 transport plane has no special advantages over other TL planes as far as the crew is concerned.

However, crews which are being re-trained directly after experience with planes with reciprocating engines, such as the IL-12 and the IL-14, have to receive basic training in order to master the especially different take-off and landing technique. This is no problem for a pilot with a good avaiation background.

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Another serious problem is the changing of the entire ground service.

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